PROOF-OF-PRINCIPLE SPACE LAUNCHES FROM OMELEK ISLAND ENVIRONMENTAL ASSESSMENT

U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND

AGENCY: U.S. Army Space and Missile Defense Command

ACTION: Finding of No Significant Impact

BACKGROUND: Pursuant to the Council on Environmental Quality regulations for implementing the procedural provisions of the National Environmental Policy Act (40 Code of Federal Regulations [CFR] 1500-1508); 32 CFR Part 651, *Environmental Analysis of Army Actions* (Army Regulation 200-2); and Executive Order 12114, *Environmental Effects Abroad of Major Federal Actions*, the U.S. Army Space and Missile Defense Command (USASMDC) prepared an Environmental Assessment (EA) to analyze the environmental consequences of conducting two proof-of-principle space launches of the Falcon Launch Vehicle from Omelek Island, U.S. Army Kwajalein Atoll/Ronald Reagan Ballistic Missile Test Site (USAKA/RTS). The Falcon Launch Vehicle Program is a venture by Space Exploration Technologies, Inc. (SpaceX) to provide space launch operations.

Since SpaceX proposes to pursue a commercial launch license, the twofold purpose of this EA is to analyze the potential effects of the Proposed Action in compliance with the National Environmental Policy Act and also for the use of the Federal Aviation Administration (FAA) in their licensing procedures. The FAA, which is a cooperating agency for this EA, will also rely on this analysis to support its environmental determination for a launch license for SpaceX for the Proof-of-Principle Space Launches program.

SpaceX is a privately held company that is developing the Falcon as a light-launch vehicle to put small spacecraft into orbit with high reliability and low cost. The Falcon is a two-stage vehicle; the first stage could be attached to a parachute and recovered, while the second stage is not intended to be recovered. The Falcon vehicle uses only liquid propellants: liquid oxygen (LOX) and kerosene. The Falcon Launch Vehicle Program is designed to require minimal time for vehicle assembly or payload processing on the launch pad; much of the assembly would be accomplished at the SpaceX facilities in El Segundo, California. The goal is to launch within a few days to one week of payload arrival at the launch site. This requires minimal time for processing the payload and minimal use of the launch pad. No additional flights are planned at this time.

The attached EA considers all potential impacts of the Proposed Action and Alternatives, including the No Action Alternative, both as solitary actions and in conjunction with other activities. This Finding of No Significant Impact (FONSI) summarizes USASMDC's evaluation of the proposed launches and alternatives.

DESCRIPTION OF THE PROPOSED ACTION: SpaceX would need to conduct limited refurbishment of existing buildings on Omelek, bring in some additional temporary buildings, and make infrastructure improvements in order to operate a launch facility for the Falcon launch

vehicle. Refurbishment activities and launch of the Falcon launch vehicle would comply with all of the USAKA Environmental Standards (UES) and the USAKA/RTS Range Safety Requirements. SpaceX proposes to construct a missile assembly building (MAB) and a new launch pad and to make minimal modifications to the existing Omelek site. The MAB construction would consist of a 12-meter by 30.5-meter (40-foot by 100-foot) concrete pad a minimum of 0.3 meter (1 foot) thick with a metal-framed "Butler" building constructed over it. The facility would be connected to the existing power system on the island. The new launch pad would include a berm to contain an accidental release of kerosene prior to launch. The berm would also be used to contain up to approximately 7,570 liters (2,000 gallons) of deluge water spray used during launch. A valved drainage system would be included in the pad to allow rainwater drainage when the pad is not in use. The water for the deluge system would be supplied from the ocean. A temporary land-based pump would be connected to an attended intake hose that would be floated into the lagoon and suspended just under the water. Lines to the spray system on the launch pad would be placed temporarily on the ground for each launch. The deluge spray would be used to keep surfaces relatively cool, at least below their respective melting points. Freshwater would be used to clean the pad and equipment prior to and after launch and for any required fire suppression.

After each proof-of-principle flight test, the deluge water remaining on the launch pad as well as water used to clean the launch pad before and after launches would be placed in a temporary evaporative pond and tested. If contaminants are found, the wastewater would be containerized and disposed of according to UES requirements. If no contaminants are found, the water would be allowed to remain in the pond and evaporate. Measures would be taken (e.g., a tent or elevated tarp cover over the pond) that would allow evaporation but also prevent access by birds that could be attracted to the standing water.

A concrete pad would be poured to support a LOX plant and storage tanks; although LOX and liquid nitrogen may be brought in from the United States. Two new mooring buoys would be added to the lagoon to the west of the two arms forming the harbor at Omelek. The buoys would be sited on sandy bottom areas using a small steel rod and shackle plate far enough away from any coral to prevent the chain and line off the pin on the bottom from abrading the coral during rise and fall of the tides. The buoys would be used to moor small powerboats when the landing craft is present. The powerboats would be used to transport personnel and cargo from Meck to Omelek and to evacuate personnel from Omelek before the launch.

The Falcon would carry small payloads consisting mostly of non-hazardous materials. However, small amounts of ordnance, such as small explosive bolts, pressurized helium, and yet-to-be-defined batteries could be used in the payloads. In the event the Falcon launch vehicle varies from its planned trajectory, the launch vehicle would be equipped with a thrust termination system, rather than a destructive flight termination system. The thrust termination system would be activated by a command from the Range Safety Officer and would disable power to the vehicle engines.

The proposed launch site could accommodate safe trajectories for almost any orbital inclination. The first Falcon mission from Omelek would be a sun-synchronous orbit (satellite passes over the same part of the earth at about the same local sun time each day) at an 800-kilometer (497-

mile) altitude with a launch azimuth of –3 degrees. The second mission would be for a 90-degree azimuth to an orbit of 685 kilometers (425 miles).

ALTERNATIVES CONSIDERED: There are four options for the locations of the facilities to be used at Omelek. Option 1 involves the construction of a new launch pad, the LOX plant, and fuel storage facilities on the east side of the island. The LOX plant would be built more than 24 meters (80 feet) from the center of the launch pad. The new MAB would be sited on the southwest quadrant of the island along with the J.A. Jones building. The launch control van would be placed on the west side of the island.

In Option 2 the launch pad and a new 4.3- by 30.5-meter (14- by 100-foot) slab to facilitate connecting the erector to the launcher would be constructed on the northern part of the island. The LOX plant would be built west of the slab more than 24 meters (80 feet) from the center of the launch pad. The fuel storage facility would be built on the east side of the slab. A new road would be required. The MAB and the J.A. Jones building would all be placed in the southwest quadrant of the island, as in Option 1. The launch control van would be placed between the MAB and the J.A. Jones building.

In Option 3 the launch pad and slab, the LOX plant, and the fuel storage facility would be built in the same sites as described in Option 2. The MAB would be built on the east side of the island. The J.A. Jones building would be placed in the southeast quadrant of the island. The launch control van would be placed in the southwest quadrant of the island in the same location used in Option 2.

In Option 4 the location of the launch pad, the LOX plant, the MAB, and the fuel storage facility would be the same as described in Option 1. The J.A. Jones building and the launch control van would be placed on the west side of the island. Option 4 is the Preferred Alternative.

The No-action Alternative was also considered. Under the No-action Alternative, the proposed Falcon launch vehicle activities would not be conducted at Omelek and SpaceX would not proceed with the modifications to the facilities on Omelek. SpaceX would not be able to demonstrate the capability/establish the infrastructure at Omelek to launch satellite payloads into orbit from USAKA/RTS.

METHODOLOGY: USASMDC analyzed the potential for impacts to air quality, airspace, biological resources, cultural resources, geology and soils, hazardous materials and waste, health and safety, infrastructure, noise, and water resources in the EA. USASMDC determined that implementation of the Proposed Action would not result in significant impacts to any of the resource areas listed above. All activities would be carried out in compliance with applicable federal and USAKA/RTS regulations and requirements.

Air Quality: Facility modifications and site preparation activities necessary for the Falcon launches would have a localized, minimal impact on air quality. Each launch is considered to be a discrete event that generates short-term impacts to the local air quality. Long-term effects resulting from launches are not expected because the launches would be infrequent and the resulting emissions would be rapidly dispersed and diluted by trade winds.

Airspace: Although site preparation activities could involve flights in and out of Bucholz Army Airfield on Kwajalein, they would not restrict access to, nor affect the use of, existing airfields and airports in the region of influence. SpaceX would coordinate Falcon launches with the Federal Aviation Administration through the USAKA/RTS Commander, which would include scheduling to avoid airspace conflicts.

Biological Resources: The Proposed Action is not likely to result in the removal of large amounts of native vegetation. Construction of the MAB under options 1, 2, and 4 would require removal of 2 to 3 small palm trees, but a few coconuts could be placed in a designated location in other areas on the island and allowed to grow if one of these options is selected. Prior to their arrival on Omelek, SpaceX personnel would be briefed on the need to respect and protect sensitive island resources, including the remaining native forest, and to avoid harassment of sensitive species. As part of this orientation, the sensitive nature of the habitat would be emphasized and personnel would be instructed to stay on existing roads and paths where possible. If either Option 1 or Option 4 is selected by the decision maker, signs would be placed on the north end of Omelek designating sensitive areas. Immediately prior to their shipment to Omelek, prefabricated buildings and all other materials would be inspected and if necessary treated for pests (e.g., rats, mice, and ants) and other non-native organisms to prevent their potential spread and introduction to other USAKA islands.
Disturbance from the launches would be brief and, based on existing analysis of prior and current launches from the region, is not expected to have a lasting impact nor a measurable negative effect on wildlife, including migratory bird populations and threatened or endangered species. Debris impact and booster drops in the open ocean are not expected to adversely affect marine mammal species. The probability is rather low that migratory whales or sea turtles would be within the areas affected. However, on the day of launch or the day before, SpaceX or USAKA/RTS personnel would fence the beach 100 meters (328 feet) on either side of the launch site just above the wave surge area (so the fence will remain in place) at a sufficient height to prevent sea turtles from hauling out at this area. After each Falcon launch, the remaining deluge water would be collected in a temporary evaporative pond and tested for contaminants. The water would be pumped into drums and removed from the island if found to be contaminated. Non-contaminated water would remain in the evaporative pond. The residual salt would be disposed of in the Kwajalein landfill.

A habitat enhancement project would be undertaken as a mitigation measure that would benefit the natural environment of Kwajalein Atoll under USAKA jurisdiction to offset the potential impacts of the Falcon Launch Vehicle Program on Omelek. An ant eradication project on Eniwetak would be performed by USAKA/RTS using methods developed and implemented in coordination with the Fish and Wildlife Service. This project would be performed in conjunction with other habitat improvement/restoration activities that will occur on Eniwetak. Use of ant bait that is noninjurious to crabs and other species could be used effectively to control invasive ant species and would produce the desired effect in a relatively short period of time.

Cultural Resources: The proposed launch pad, new facilities, and associated infrastructure would be primarily placed in areas that have been previously disturbed. Personnel involved in the proposed activities would follow requirements in the UES in handling or avoiding any cultural resources uncovered during site preparation or operation of the site. No impacts to cultural resources are anticipated.

Geology and Soils: Best Management Practices, such as regular watering of excavated material if required, would reduce the potential for soil erosion during site preparation and construction. The emission products of the Falcon launches would consist mainly of steam and carbon dioxide with no resultant impacts to area soils.

Hazardous Materials and Waste: Materials proposed for use are similar to hazardous materials already in use for other operations and would represent only a small increase in the total amount of materials to be handled and could easily be accommodated by current hazardous materials management systems. The types of hazardous wastes generated as a result of the Proposed Action would be similar to those already handled at USAKA/RTS. Hazardous waste management at USAKA/RTS would continue to be performed in accordance with the USAKA Environmental Standards.

Health and Safety: Refurbishment activities required for the Falcon Launch Vehicle Program would comply with the UES and all applicable USAKA/RTS Range Safety Requirements. At Kwajalein, as at all other USAKA/RTS locations, all operations involving explosives (including packaging and handling for movement) would require implementation of a written procedure, which has been approved by the USAKA/RTS Safety Office.

The Marshallese individuals who have written permission from USAKA to stay temporarily on Omelek while fishing from the adjacent islands of Gellinam or Eniwetak would be asked by the USAKA/RTS Commander to evacuate the launch hazard area once the Falcon missile has been brought to the Island. Two Falcon launches should not substantially affect this practice. Islands of the atoll and access to the mid-Atoll corridor are routinely closed during launch events. Once the launch has been accomplished and the associated facilities secured, the Marshallese can resume their temporary habitation. Access to Omelek would be limited to all but mission essential persons and personnel would be evacuated from the island prior to launch. Some emergency lighting will be provided around the dock area to facilitate an evacuation at night.

Infrastructure: The temporary increase in utility demand caused by Falcon activities is not expected to result in adverse affects to infrastructure on Kwajalein or Meck Island, since the number of personnel required would be within the range routinely handled by USAKA/RTS. No adverse impacts to the current transportation system are anticipated. SpaceX would provide up to two 500-kilovolt generators for power on the island. Potable water would be supplied on a weekly basis from Kwajalein. Abandoned restroom facilities and the leach field on Omelek would be refurbished as required for use during launch operations.

Noise: Noise impacts from site preparation activities to the surrounding environment would be minor. The increase in mechanical noises (pre-launch and launch) would be considered temporary. These noise levels are not anticipated to impact SpaceX personnel as they would be evacuated from the island prior to the launch. Falcon launches from Omelek would be over the open ocean and at an altitude of approximately 8 kilometers (5 miles) when it goes supersonic. The resultant sonic boom should not adversely impact any of the surrounding USAKA islands.

Water Resources: Minor construction activities would be confined within the immediate construction area in compliance with the USAKA Environmental Standards and would not impact water resources. The exhaust plume produced during launch would consist mainly of steam and carbon dioxide. The carbon dioxide, when mixed with the deluge water, would create

carbonic acid, which would then break down into bicarbonate and hydrogen ions and create a mild acid similar to a carbonated beverage. The steam produced is anticipated to have the same pH as rainwater; that, combined with the fact that most of the steam from the exhaust plume is expected to rapidly evaporate, should produce no long-term effects. Thus, no impacts to water resources should occur as a result of launch emissions.

CONCLUSION: Based on the environmental analysis in the Proof-of-Principle Space Launches from Omelek EA, USASMDC has determined that no significant impacts would occur as a result of the construction/restoration and operation of the Falcon Launch Vehicle launch site and related support facilities. Under the No-action Alternative, no environmental consequences associated with Falcon Launch Vehicle launches would occur. Preparation of an Environmental Impact Statement, therefore, is not required. The Environmental Assessment and draft Finding of No Significant Impact are available at http://www.smdcen.us/eaeisdoc/spacex.asp.

DEADLINE FOR RECEIPT OF WRITTEN COMMENTS: 21 January 2005

POINT OF CONTACT: Submit written comments or requests for a copy of the EA to:

U.S. Army Space and Missile Defense Command
Attention: SMDC-EN-V (Thomas M. Craven)
Post Office Box 1500
Huntsville, Alabama 35807-3801

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REVIEWED:

DATE: 05 Feb 05

ANNE DAUGHERTY
Lieutenant Colonel, U.S. Army
Commander
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REVIEWED:

Timothy W. Mango DATE: 2 Feb 05

TIMOTHY W. MANGO
Lieutenant Colonel, AV
Director, Kwajalein Support Directorate

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U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND

ACTION: Finding of No Significant Impact

APPROVED:

DATE: 8 Feb 05

BEVERLY M. STIPE
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